inadequate, and speciously misleading as to the value and priority of his own work. The bibliography of the entire subject is most easily accessible in any well-arranged botanical library. The lack of consideration to published researches is most marked with respect to articles in English and American journals, and while it may not be wilful neglect, yet it is constructive ignorance and speaks most clearly of a careless and unscientific habit of inves-

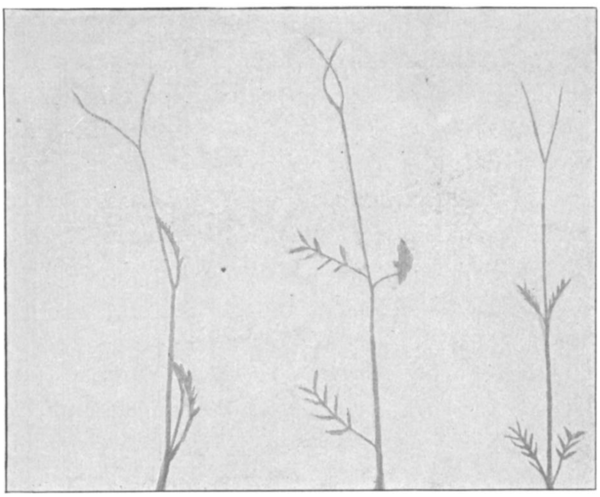

FIG. 2. Various positions assumed by tendrils of *Entada scandens*.

tigation, entirely inexcusable in an author of such extensive experience. Furthermore, it is indicative of a form of narrow provincialism to which the writer has had occasion to call attention more than once. (See Transmission of Impulses in *Biophytum* Bot. Centralb. **77**: 297. 1899.) In the present instance it renders Dr. Haberlandt's work untrustworthy to quite a degree.

CRYPTOGAMIC AND PHYSIOLOGICAL BOTANY AT COLD SPRING HARBOR IN 1901

BY EDWIN BINGHAM COPELAND

The Flora.—The field work in cryptogamic botany, carried on in major part by Mr. A. F. Blakeslee, has resulted in a large

addition to the known local flora. Among Myxomycetes, which were submitted to Professor Macbride for final determination, and among Fungi, the reported flora of Long Island has been found most incomplete. The following representative genera, from the list of this season's collections, will show how remarkably rich Cold Spring Harbor is in the types usually chosen for laboratory study, and what advantages it therefore offers both for local work and for the collection of material for class use elsewhere:

Anabaena, *Lyngbya*, the Oscillarias or Oscillatorias of laboratory guides, and of course bacteria; numerous Peridineae and diatoms; all the chief genera of Myxomycetes except *Trichia*; *Volvox*, "*Proctococcus*," *Ulva* and *Monostroma*, *Spirogyra*, desmids including very large *Closterium*, *Bryopsis*, *Vaucheria*, *Cladophora*, *Bulbochaete*, *Nitella* (introduced by Dr. Johnson, now common), *Ectocarpus*, *Fucus* and *Ascophyllum*, *Nemalion*, *Agardhiella*, *Polysiphonia*; *Albugo* and *Peronospora*, *Saprolegnia*, *Sporodinia*, *Mucor* of course, and *Penicillium*, *Taphrina*, *Microsphaera*, *Peziza*, *Cordyceps*, *Ustilago*, *Puccinia*, *Uredo* and *Aecidium*, *Exobasidium*, *Stereum*, *Hydnum*, *Polyporus*, *Strobilomyces* (splendid material for the study of basidia and spores), *Coprinus*, *Amanita*, *Scleroderma*, *Crucibulum*, *Dictyophora*; *Riccia*, *Marchantia*, *Conocephalum*, *Cephalozia*, *Notothylas*, *Funaria*, *Dicranum*, *Georgia*, *Polytrichum*; *Botrychium*, *Osmunda*, *Adiantum*, *Pteridium*, abundant undetermined prothallia, *Equisetum*, *Lycopodium* and *Selaginella*. *Marsilea* is reported, but was not collected this year. Fully 80 per cent. of these grow within a quarter of a mile of the laboratory.

Geotropism of Fungus Stipes.—Work in physiological botany has been attempted at Cold Spring Harbor this season for the first time, and the wealth of unworked material has coaxed attention in various directions. The geotropism of the stipe of the Boleti and agarics—*Amanita* is excellent material—is essentially the same as that of phanerogams. All parts of the stipe are irritable, and there is no evidence that the stimulus is transmitted. But if the horizontal stipe is fastened at the pileus end, the base being free, it may curve as much as 180°; the zone of most rapid growth, and therefore of most rapid curving, moves toward the pileus, carrying the fixedly bent basal part beyond the perpen-

dicular. An egg of *Simblum* "aimed" horizontal shortly before its rupture gave rise to a horizontal mature fructification. The absence of geotropism seems to substantiate the view that the elongation of the stipe of the Phalloidei is an essentially different process from ordinary growth.

Extrusion of the Gametes of Fucus.—As is well known, the the gametes of *Fucus* are extruded from the conceptacles during low tide, while the plants are out of water. It has been suggested that the cause of their exit might be the removal of the pressure of the water. But this pressure, even at high tide, is insignificant. In reality, the *Fucus* plants shrink very appreciably during low tide. As they begin to dry, the outer layers lose some of the great amount of water which they hold by imbibition, and their consequent contraction compresses the inner layers. The pressure thus exerted against the conceptacles forces out a part of their water content, carrying along the gametes, usually before they separate from one another. Pinching a fruiting tip between the fingers has the same result. As Strasburger suggests (Praktikum, 296, 2d ed.), active gametes may be obtained for study at a distance from the coast, and are extruded when plants are removed from their vessel of sea water and allowed to dry for a few hours. Instead of having sea water shipped, I have made it for use at West Virginia University; it need not be at all accurately made. The development of the conceptacles and fruiting organs of *Ascophyllum* seems to be hastened by keeping the plants constantly submerged in standing water.

Adaptations of Spartina polystachya to Environment.—*Spartina polystachya* Willd. is the characteristic plant of the lowest tidewater zone inside the bar of Cold Spring Harbor. The lowest scattered plants grow where the tide leaves them from 3 to 3.5 hours. The lowest patches are left for about 4 hours. The best development, both in density and height comes where the ground is above water nearly half of the time. Near high tide mark the plant disappears again. Young plants then spend from one-quarter to three-quarters of their time submerged, and it may therefore be assumed that immersion for some hours does

not interfere with their photosynthesis. But the cuticle is strongly developed, and intercellular spaces are very inconspicuous in the leaf. As the plants grow taller the leaves are more of the time above water, and are stiff enough so that many of them stand erect above the surface, but when too great a length is exposed they float. Free movement of gases, when the leaves float or are submerged, is insured by the position of the stomata. These occur only on the upper surface of the leaves, where they are confined to the sides of deep and narrow clefts. The walls of these clefts are beset with papillæ, which further narrow them and increase their surface until it is practically impossible that the air in them should be driven out by water. The stomata being protected against plugging by water, the plants continue to take up carbon dioxide though entirely under water (*Cf.* Pfeffer, Pflanzenphysiologie, **1**: 161, 2d ed.). As must be expected, especially from Stange's work (Bot. Zeit. 1892), the plant meets the concentration of the sea water with an over-regulation of its turgor. In the mesophyll, in a leaf reaching above high tide, I have found plasmolysis just beginning in 7.5 per cent. KNO ; in the cortex of the roots, in 7 per cent. KNO. I could find no root hairs.

SHORTER NOTES

Weeping Tomatoes.—Some days after clearing off a plot of ground in tomatoes for the past season it was observed that the places where the plants had stood were moist while all the other area was covered with the dry, finely raked earth. Upon examination it was found that this moisture was due to water that flowed from the roots of the tomato plants that had broken off and remained in the soil in the process of pulling. Further inspection showed that when a broken end of one of the larger roots chanced to extend above the soil its exposed fraction was wet and dripped water so that it glistened in the late October sun. From some roots that arched over with the broken end pointed downward the water fell in drops to the soil which was literally muddy below the live spigot.

Having other plots to clear, many of the tomato plants were